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ROCHESTER INSTITUTE OF TECHNOLOGY

A Thesis Submitted to the Faculty of

The College of Fine and Applied Arts

in Candidacy for the Degree of

MASTER OF FINE ARTS

FIBER OPTIC GARMENTS

by

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May 22, 1986

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INTRODUCTION

In the 1985 fall quarter, the Textile department offered a multi-layer weaving course. This technique was used to construct two simple garments. These were the forerunners of the garments produced for the thesis work.

There was no conscious decision to create garments. In fact, early in fall quarter, the direction of the work was sculptural and kinetic. At the conclusion of fall quarter, however, it was obvious that wearables would be the focus of the thesis research.

In 1985, Bruce Chapin exhibited a group of intriguing wood sculptures in an MFA thesis show in the Bevier Gallery. These sculptures were a unique and thoughtful combination of splintered wood, paint and light. At certain angles, light was visible within them. This work greatly influenced the decision to utilize light in the garments.

There were three available options for lighting the garments: LED's (light-emitting diodes), Christmas tree lights, and fiber optics. LED's were available in a variety of sizes and three or four colors, but, like Christmas tree lights, have already been used in art and garments. Both of these alternatives were too gaudy for the type of garments being designed. Fiber optics were ideal because they could be woven and were a more subtle form of lighting.

FIBER OPTICS

Fiber optics are glass or acrylic filaments which collect light waves at one end and transmit them through the other end at the same frequency. The molecular structure of the inside of a fiber optic strand must be flawless to enable the light waves to bounce through without interruption. If the molecular structure is imperfect, the light will be refracted out along the length of the fiber optic and the frequency of the emitted light waves will decrease.

Telecommunications and medical technology currently employ glass fiber optics, which are generally smaller and more brittle than acrylic strands. Both glass and acrylic fiber optics are available with or without opaque protective plastic sheaths. They may be sheathed singularly or in bunches. JerryCo Inc., an affiliate of the American Science Center, a surplus supply house in Evanston Illinois, was an ideal source for inexpensive fiber optics.

EXPERIMENTATION WITH FIBER OPTICS

Acrylic fiber optics had some interesting advantages over glass. They could be bent at an acute angle without breaking and were generally quite flexible. A few experiments with heat and surface treatment revealed some interesting aesthetic possibilities. Heating the end of a strand caused the end to melt back on itself and form a mushroom which acted as a mini-lens for the emitted light. If the strand caught on fire, it gave off a foul odor but the end also bubbled up into a nubby bead. This produced a star-like effect with little pings of light. Cutting into the surface of the fiber optic strand with scissors or wire cutters produced light-emitting knicks. Fiber optics dipped in acetone or sandblasted glowed with diffused light along the length of the strand.

METHODS FOR LIGHTING GARMENTS

Two methods were employed to illuminate the fiber optics in the garments. The first method depended upon overhead light already available in the environment, such as sunlight or a spotlight. Providing the garment with an independent light source was the other method. The advantage of a garment lit by overhead light was that it did not require any maintenance. However, it was ineffective if worn at night or in an environment with diffused lighting. The benefit of a battery powered garment was that it could be worn without any environmental limitations. The disadvantage was that it required maintenance.

EXPLANATION OF BATTERY POWERED LIGHT SOURCE

The light source for the garments needed to be compact and brilliant enough to illuminate a large quantity of fiber optic strands, yet cool enough to prevent the ends from melting. A rear signal light from a car seemed ideal, but it melted a plastic film cylinder in less than one minute. The solution was the mini mag lite, a small, adjustable beam flashlight. The mini mag lite was ideal; it possessed a high intensity bulb, yet the aluminum cannister absorbed the heat given off and kept the face of the flashlight cool.

In order to light the fiber optics evenly, it was necessary to gather them into a bundle and to secure them with a commercial material called heat-shrink tubing. The bundle was placed with the ends pointing towards the face of the flashlight. Secured with a second piece of heat-shrink tubing, the ends of the bundle pointed towards the face of the flashlight. This connection directed all of the light through the fiber optics. (See Diagram 1, Page 5)

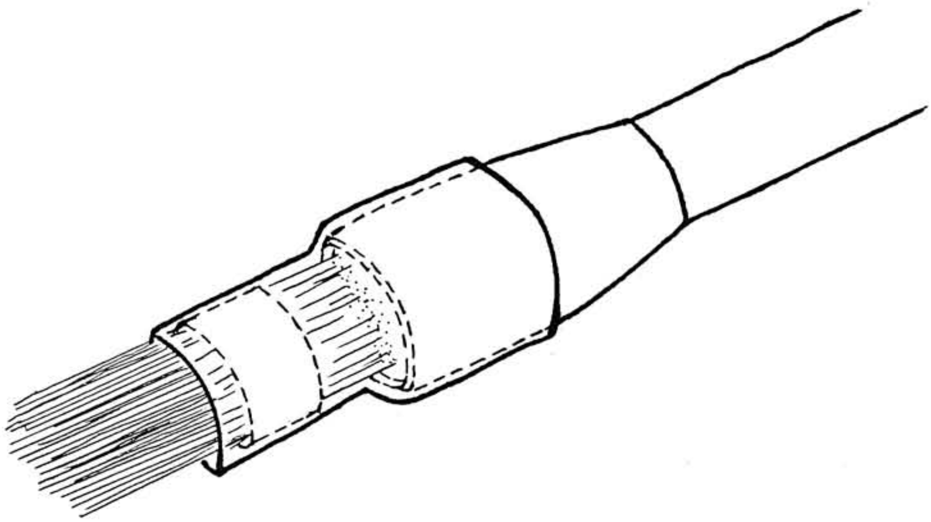


DIAGRAM 1

THE PINK PARTY DRESS

The goal of the pink party dress was to sew a sample garment to test fiber optics and light with fabric, and to work through any technical difficulties that might arise with the battery powered light source.

Though it was a commercial pattern, this particular design worked well with the fiber optics. The design of the skirt was similar to an apron and open in the back. The open area was filled with netting. The fiber optics were interspersed throughout the netting and gathered in one bundle under the large bow. (See Plate 1, Page 7)

This dress was beautiful when lit, but the design was not an original. Before viewing this dress, the assumption was that commercial patterns would be used for all of the thesis garments. At its completion, though, it seemed necessary that future designs be original. This required practice in drawing the figure and clothing from patterns, magazines, and books. This practice continued until it was relatively easy to draw the figure from memory. Developing this skill made it much easier to record ideas as they unfolded.

PLATE 1

THE LILAC JACKET

The goals for this piece were to create a jacket with a futuristic feeling, to use straight forward, nonelectrical lighting, and to combine fiber and metal with fiber optics. The design of the jacket came from an imaginative projection of what future generations might wear while living in space, as well as from the current trend of New Wave hairstyles. (See Plate 2, Page 10)

In order to achieve illumination without the use of a battery powered light source, the fiber optics were placed where light naturally bathes the human form. In this jacket, the placement of the fiber optics created a relationship between the light source and the individual wearing the garment. If, for example, a model wearing the jacket was walking down a hallway with ceiling lights every three or four feet, the fiber optics would be brighter when directly under the source of illumination, and would become progressively dimmer as the model's distance from the light source increased.

The yardage consisted of a silk and cotton warp, and a silk, mohair, and fiber optic weft. Laying the pattern pieces on the crosswise grain of the fabric allowed the fiber optics to be positioned vertically when the garment was constructed. Because fiber optics could be damaged or broken in the process of machine sewing, the jacket and the dyed lining were taylored by hand.

Since the fiber optics would be projecting upwards, it was necessary to find a structure to secure them. While working on designs in a metals course, a fascination developed with jewelry hanging from or resting on the shoulder. The addition of metal work, which would not only secure the fiber optics, but draw attention to the shoulder area, was the solution. Research was begun on epaulets.

Familiarity with the basic form and design of epaulets led to a more contemporary interpretation: woven bands of fine silver wire, cut into one inch lengths and formed into little connecting domes, secured the fiber optics and ornamented the shoulders and sleeves.

Following the construction of the jacket and lining, the ends of the fiber optics were threaded through the domes and melted. The domes were sewn in place and in the space between the the domes, small bezel-set moonstones were sewn. A one inch band of fine woven silver wire functioned both as a seam binding for the lower part of the garment, and as a belt. A constructed sterling silver French clasp, attached to the belt, fastened the jacket at the waist. (See Detail, Page 11)

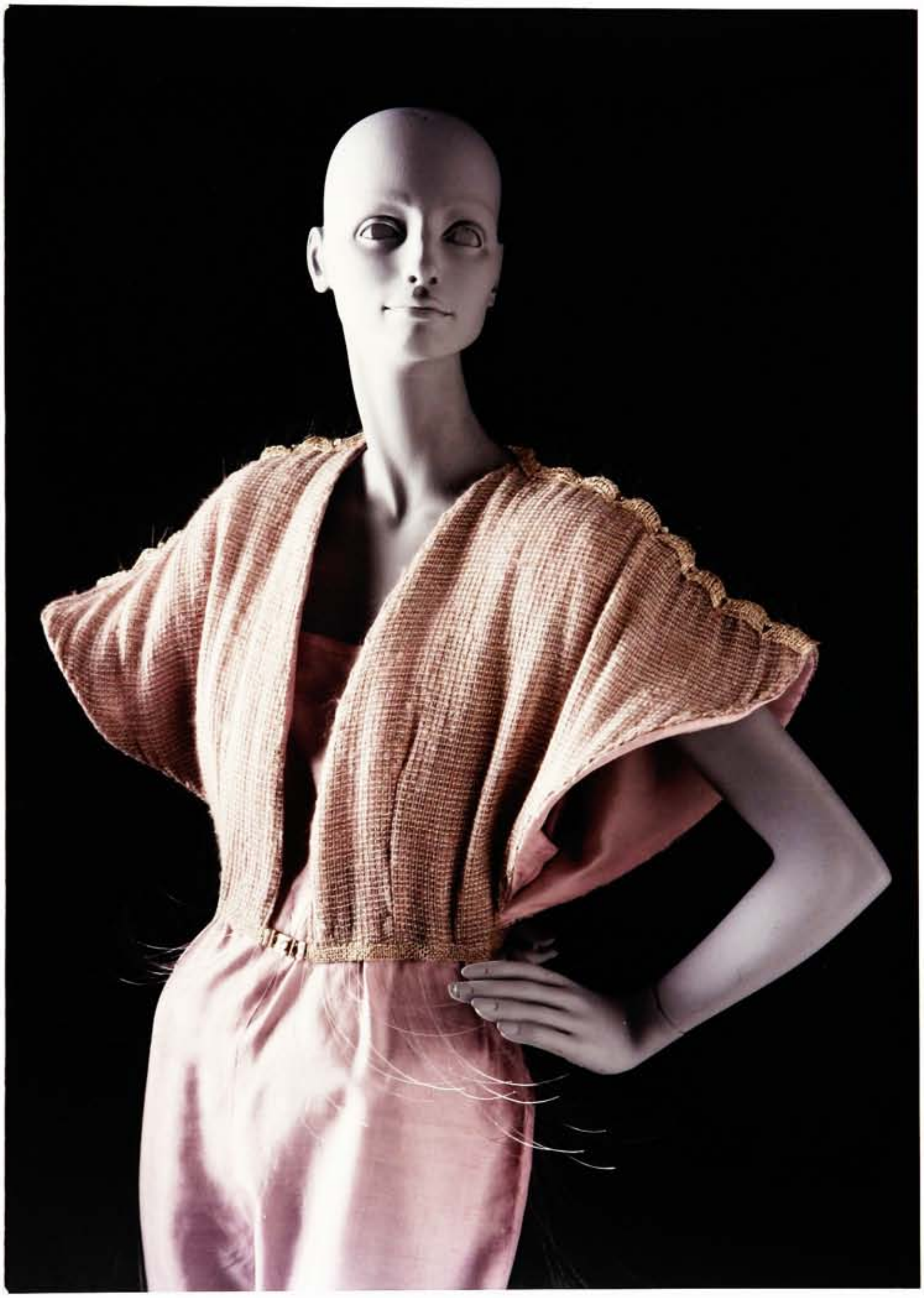
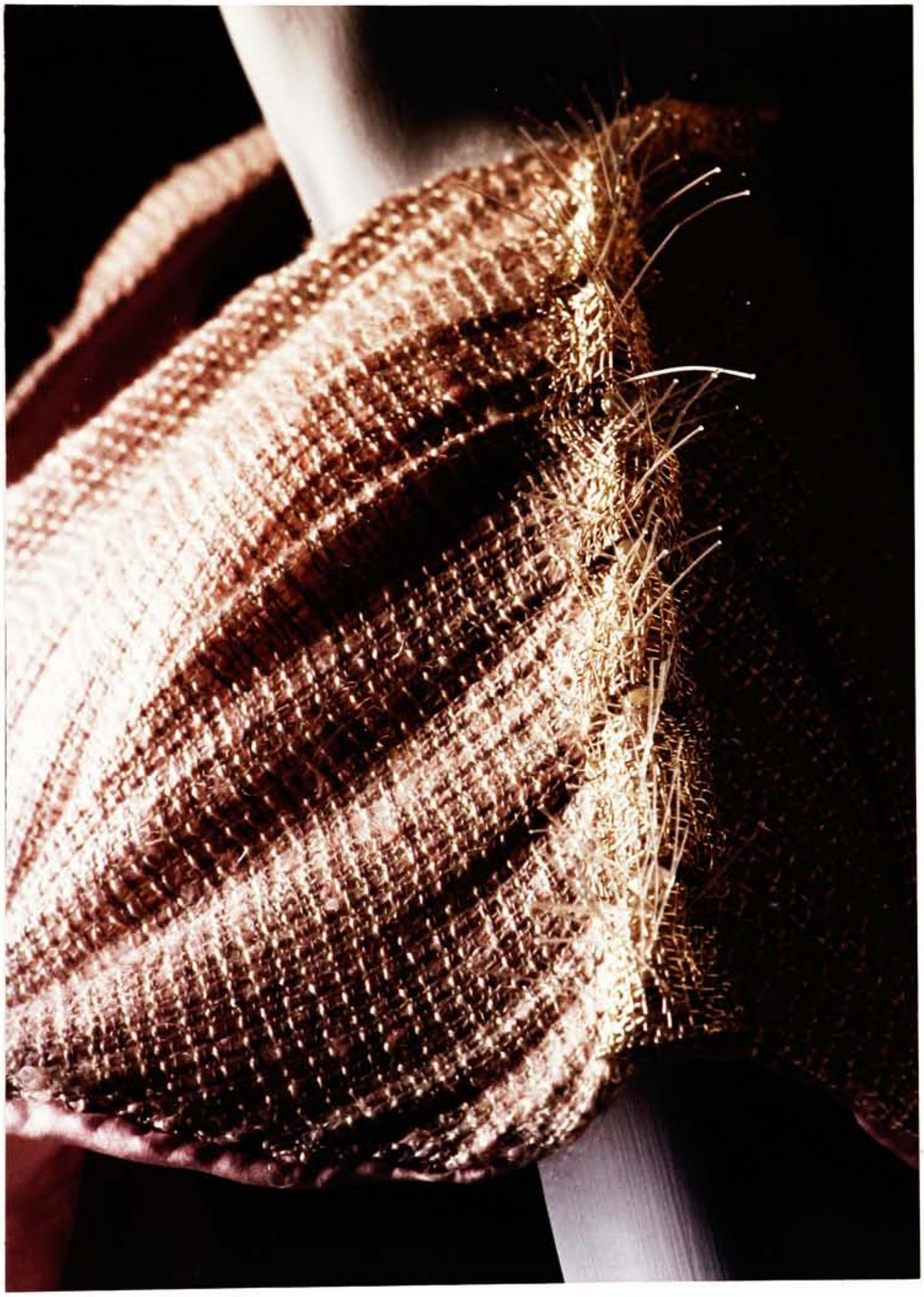


PLATE 2



DETAIL

THE PEACH STOLE

The lilac jacket's design preceded its weaving and construction; one objective, therefore, for the second piece was to work more spontaneously. The inspiration for the piece came from the elegant stoles worn by the women pictured in Women's Wear Daily. Designed specifically for evening wear, it required a battery powered light source.

Crocheting with silk and mohair without a pattern, the piece evolved into a stole form which draped diagonally across the shoulders and upper body. Experimentation with draping and the shape on a dress form was essential as the stole evolved. Once the stole was completed, a neck and armhole facing was designed and constructed from silk dyed to match the color of the stole. This facing housed the fiber optics, which were threaded through its seam. Once the fiber optics were threaded, the ends could be arranged around the sleeve and in the folds of the neck.

Small peach colored fresh water pearl beads, slipped onto the fiber optic strands, prevented the fiber optics from slipping back through the facing. Melting the ends with an iron prevented the pearls from slipping off the strands.

An evening gown, sewn from dyed peach silk, functioned as an undergarment for the stole. A godet, added in the side seam at the knee and dotted with fresh water pearls, complimented the flowing lines of the stole. (See Plate 3, Page, 13)

PLATE 3

THE CLOAK

The ornate collars worn by men and women during the sixteenth and seventeenth centuries in Europe inspired the fiber optic collar for this piece. However, while weaving the four inch wide panels for the collar, new designs temporarily replaced the idea for the fiber optic collar.

In the first design, the panels were arranged horizontally across the front of a blouse and mini-skirt outfit. This design was abandoned, though, because it was too awkward. In the second design, the fiber optic panels were to have been cut into squares, attached to the front of a long tunic, and arranged in horizontal and vertical lines similar to a Mondrian painting. Neither of these designs was satisfactory.

A silk yardage, woven in a Monk's Belt variation, suggested a simpler garment than those previously designed. At this point, the idea for the fiber optic collar was revived and a decision was made to create a cloak from the yardage. (See Plate 4, Page 15)

To compliment the silk yardage, an additional eight inch wide plainweave silk yardage was woven. A shot of metallic thread, inserted every two inches, when pulled later, gave the fabric a shirred effect.

The cloak was constructed as follows: Long triangles, cut from the silk yardage, alternated with the plainweave bands to form the body of the cloak. Small sterling silver beads, slipped onto the fiber optics, added a decorative element to the collar. Melting the ends of the strands held the beads in place, and prevented the fiber optics from sliding back through the panels. A facing, attached to the collar, concealed the fiber optics and the mini mag lite. (See Detail, Page, 16)

PLATE 4

DETAIL

CONCLUSION

This body of work represents a commencement, and is the evidence of a commitment to explore possibilities, to listen, and to develop ideas. It also represents the joy found in decorating the human form and an enthusiasm for combining different materials and processes.

The directions pursued from here will include investigations of smaller fiber optic accessories such as hats, hand bags, and sunglasses, as well as the continued the exploration of fiber optics in garments.

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